

Appl. No. : 09/727,070
Filed : November 29, 2000

Rejections Under 35 U.S.C. § 112

The Examiner has rejected Claims 1-19 under 35 U.S.C. § 112, second paragraph as failing to particularly point out and distinctly claim what is regarded as the invention.

Claims 1 and 6 have been amended to include the 'straight line' or the arc-shaped curve, and Claim 6 has been amended to substitute "segment strand" for "part" as suggested by the Examiner. Claim 12 has been amended to include 'said' before grooves, as suggested by the Examiner.

With regard to the rejection concerning a broad limitation coupled with a narrow limitation in Claim 1, the applicant respectfully submits that the limitations recited by the Examiner are not broad or narrow versions of the same limitation, but are separate limitations. The limitation regarding the discontinuous point defines the area where the curves intersect, whereas the straight line or arc shaped limitation describes the area between the intersections. The rejection given by the Examiner and the cases cited in the action are applicable to a different type of claim language than that presented in this claim.

With regard to the same rejection of Claim 6, the applicant also submits that the Claim satisfies Section 112. In the fourth element, the portion of the segment strand between grooves is defined as a straight line or a concave arc. In the seventh element, the depth of this portion is defined with respect to the total cable diameter. The ratio of D/d is stated to be between 0.0 (which would be a straight line) and 0.018. There is no issue here of uncertainty about whether the narrower limitation, which is the depth of the concavity, is merely "exemplary" or is a required limitation. The literal scope of this claim is limited to concavities with depths in the range specified, i.e. from 0.0 to 0.018d.

Accordingly, Applicant maintains Claim 1, 6 and 12 are patentable. As Claims 2-5, 7-11, and 13-19 are dependent on independent Claims 1, 6 and 12, Claims 2-5, 7-11, and 13-19 are patentable for these reasons as well as for the limitations present in their independent parent claim.

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Rejections Under 35 U.S.C. § 102

The Examiner has rejected Claims 1, 3-5, 12, 14-16 and 19 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,711,143 to Munakata et al. The Examiner has also rejected Claims 2 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Munakata et al.

Applicant respectfully traverses these rejections and the Examiner's characterization of the cited reference.

Applicant respectfully submits that Munakata does not teach or suggest the combination of features recited in Claims 1 and 12 of the above-referenced application. Applicant's Claim 1 recites, among other limitations, "wherein in the contour of the cross-section of said outermost layer, each groove comprises an arc-shaped curve having a predetermined radius R centered about a vertex of a regular polygon and each segment strand between adjoining grooves comprises a straight line or an arc-shaped curve which has a longer radius of curvature than the radius R and is concave with respect to said straight line, and wherein there is a substantially discontinuous point between the arc-shaped curve and the groove." Applicant respectfully submits that Munakata does not teach or suggest each segment strand between adjoining grooves having a straight line or an arc-shaped curve which is concave with respect to said straight line with a discontinuous point between the arc-shaped curve and the groove.

As defined in the pending independent Claims, the "groove" is the concave portion formed by adjoining edges of segment strands. These adjoining edges are shown as radial lines in Munakata (see element 8 in Figure 5 for example). Between these grooves are the surface portions of the segment strands. In both Figures 22 and 23, Munakata includes convex surfaces between the grooves formed by adjacent segment strands. In Figure 22, there is one continuous convex surface between grooves. In Figure 23, the surface between the grooves has a central concavity with convex portions on either side. The surface of Figure 23 is therefore wavy, with all of the concavities and convexities having approximately equal radii of curvature.

In contrast, the claims include the limitation that 'each segment strand between adjoining grooves comprises a straight line or an arc-shaped curve'. Furthermore, the claims also include the limitation that the segment strand surfaces between the grooves have a larger radius of curvature than the radius of curvature of the groove. As described above, the radius of curvature of the segment strand surfaces is about equal to the radius of curvature of the groove in Munakata.

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As described in the specification, the arc-shaped curve which is concave increases the speed in the bottom of the boundary layer because the fluctuations in pressure are made at the vertexes of the polygon. The concave arc-shaped curves and the discontinuous points which create the vertexes cause turbulence. The breakaway point of the flow moves to the back flow side, a back flow zone of the cable is reduced, a negative pressure area generated downwind of the cable is reduced, and therefore the drag becomes smaller. Munakata does not have these vertexes which are a result of the discontinuous point and the concave arc-shaped curve or straight-line between the adjoining grooves.

Accordingly, Applicant maintains Claims 1 and 12 are patentable over Munakata et al. As Claims 3-5, 14-16 and 19 are dependent on independent Claims 1 and 12, Claims 3-5, 14-16 and 19 are patentable for these reasons as well as for the limitations present in their independent parent claim.

Double Patenting

The Examiner has provisionally rejected Claims 6-11 and 12-18 under double patenting. As the conflicting claims have not been patented, Applicant requests that the Examiner hold the rejection in abeyance until the other rejections have been overcome, at which point the double patenting rejection can also be withdrawn if the conflicting claims remain unpatented.

New Claims

As indicated above, Applicant has added new Claims 20-21. Claim 20 includes the added limitation that 'the outer surface of the cable is substantially free of convexly curved surfaces'. As described above, this feature is not present in any embodiment of Munakata. Claim 21 is a combination of Claims 12 and 18. Claim 18 is currently rejected only under Section 112 and provisionally for double patenting.

Applicant submits that these new claims also include a combination of features not taught or suggested by the prior art. Thus, Applicant respectfully submits that this claim is in condition for allowance, and such action is respectfully requested.

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CONCLUSION

The applicant has endeavored to address all of the Examiner's concerns as expressed in the outstanding Office Action. Accordingly, amendments to the claims pursuant to statutory sections 102 and 112, the reasons therefor, and arguments in support of the patentability of the pending claim set are presented above. In light of these amendments and remarks, reconsideration and withdrawal of the outstanding rejections is respectfully requested.

Any claim amendments which are not specifically discussed in the above remarks are not made for patentability purposes, do not narrow the claims, and it is believed that the claims would satisfy the statutory requirements for patentability without the entry of such amendments. Rather, these amendments have only been made to increase claim readability, to improve grammar, and to reduce the time and effort required of those in the art to clearly understand the scope of the claim language. Furthermore, the new claims presented above are of course intended to avoid the prior art, but are not intended as replacements or substitutes of any cancelled claims. They are simply additional specific statements of inventive concepts described in the application as originally filed.

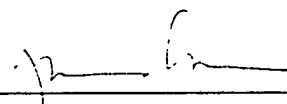
If the Examiner has any questions which may be answered by telephone, he is invited to call the undersigned directly.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims have been amended as follows:

1. (Twice Amended) An overhead cable comprising:

a tension-bearing core;

a conductive layer arranged at an outer circumference of the core; and

an outermost layer constituted by twisting together a plurality of segment strands, and having a spiral groove along the longitudinal direction in the outer circumferential surface region of each boundary portion of adjoining segment strands, wherein

in the contour of the cross-section of said outermost layer, each groove comprises an arc-shaped curve having a predetermined radius R centered about a vertex of a regular polygon and each segment strand between adjoining grooves comprises a straight line or (an arc-shaped curve which has a longer radius of curvature than the radius R and is concave with respect to said straight line;)

and wherein there is a substantially discontinuous point between the straight line or the arc-shaped curve and the groove.

6. (Twice Amended) An overhead cable comprising:

a tension-bearing core;

a conductive layer arranged at an outer circumference of the core; and

an outermost layer constituted by twisting together a plurality of segment strands, and having a spiral groove along the longitudinal direction in the outer circumferential surface region of each boundary portion of adjoining segment strands, wherein

in the contour of the cross-section of said outermost layer, each groove comprises an arc-shaped curve having a predetermined radius R centered about a vertex of a regular polygon and each ~~part~~ segment strand between adjoining grooves comprises a straight line or (an arc-shaped curve which is concave with respect to said straight line;)

wherein a diameter d of a circle circumscribing the vertex of the regular polygon is within a range from 12.8 mm to 42.6 mm;

wherein said regular polygon is made within a range from a regular 12-sided polygon to a regular 24-sided polygon;

wherein said straight line or arc-shaped curve is concave with respect to the straight line connecting adjoining vertexes of the regular polygon by a maximum depth D and a ratio D/d between maximum depth D and the diameter d of circumscribing the vertexes of the regular polygon is within a range from 0.0 to 0.018;

wherein a ratio H/d between a maximum height H from a vertex of said regular polygon to the bottom of said groove and said diameter d is within a range from a 0.0045 to 0.0357; and

wherein a ratio H/R between said maximum height and said radius R is within a range from 0.08 to 1.0.

12. (Amended) An overhead cable comprising:

a tension-bearing core;

a conductive layer arranged at an outer circumference of the core;

an outermost layer formed by twisting together a plurality of segment strands, and having a spiral groove along the longitudinal direction in the outer circumferential surface region of a boundary portion of each adjoining segment strand,

wherein in the contour of the cross-section of said outermost layer, each groove comprises an arc-shaped curve having a predetermined radius R centered about a vertex of a regular polygon and each segment strand between adjoining grooves comprises a straight line or an arc-shaped curve which has a larger radius of curvature than the radius R;

wherein the intersection between sides of the grooves and the outer contour of the segment strands between said grooves defines a sharp, substantially discontinuous edge.